PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#17
8-8-03
C Brown

Applicant(s):	Holzbach, Mark E.		
Assignee:	Zebra Imaging, Inc.		
Title:	Dynamic Scalable Full-Parallax Three-Dimensional Electronic Display		
Serial No.:	09/457,013	Filing Date:	December 8, 1999
Examiner:	Alessandro V. Amari	Group Art Unit:	2872
Docket No.:	ZEB0026US	Client Ref. No.:	116

Austin, Texas
July 28, 2003

Mail Stop: Appeal Brief - Patents
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P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

This brief is submitted in support of the appeal filed March 27, 2003 by the appellant to the Board of Patent Appeals and Interferences from the Examiner's final rejection of claims 1-32. The appellant notes that the appeal filed March 27, 2003 was received by the USPTO on April 1, 2003, thereby giving the appellant a period for filing set to expire on June 1, 2003. Filed herewith is a Petition for Extension of Time requesting a two-month extension, thereby giving the undersigned a period until August 1, 2003, in which to respond.

Please charge deposit account No. 502306 for the fee of $160.00 associated with this appeal brief. Please charge this deposit account for any additional sums which may be required to be paid as part of this appeal. This paper is submitted in triplicate.

REAL PARTY IN INTEREST

The real party in interest on this appeal is Zebra Imaging, Inc.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to this application.

STATUS OF CLAIMS

Claims 1, 3, 9, 14 and 15 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Woodgate et al., U.S. Patent No. 6,008,484 (Woodgate).

Claims 2, 4-7, 11, and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Official Notice.

Claim 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Official Notice, and further in view of Iwata et al., U.S. Patent 5,982,342 (Iwata).

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Iwata.

Claims 10, 16-18, 22, 23, 25-27, 29, and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, U.S. Patent 5,973,844.

Claims 20, 28, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger and further in view of Iwata.

Claims 19, 21, and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, and further in view of Ashihara et al., U.S. Patent 5,883,739 (Ashihara).

Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, and further in view of Official Notice.

STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection of September 27, 2002.

SUMMARY OF INVENTION

The invention is as set forth in the claims. To summarize the invention without intending to limit or otherwise affect the scope of the claims, the invention, as set forth by independent claim 1, relates to an apparatus for displaying a three-dimensional image. The apparatus includes a plurality of lenslet pixel modules. Each module is defined in part by a respective lenslet. Each lenslet pixel module corresponds with and is operable to produce a complete 3D pixel of the three-dimensional image. The apparatus also includes a plurality of two-dimensional moving image sources associated with and forming a portion of the lenslet pixel modules. The lenslet pixel modules cooperate with each other to form a projector array for displaying the three-dimensional image. See e.g., Figures 9 and 10, page 12, line 23 through page 13, line 27 of the specification, and page 24, line 25 through page 26, line 23 of the specification.

Another aspect of the invention, as set forth in independent claim 17, relates to a system for presenting a scalable, autostereoscopic image. The system includes a plurality of lenslet pixel modules with each module defined in part by a respective lenslet. Each lenslet pixel module corresponds with and is operable to produce a complete 3D pixel of the autostereoscopic image. The system also includes a plurality of two-dimensional image sources associated with and forming a portion of each lenslet pixel module. The system further includes at least one computer processing unit providing an input to at least one of the plurality of two-dimensional image sources. See e.g., Figures 9 and 10, page 12, line 23 through page 13, line 27 of the specification, and page 24, line 25 through page 28, line 9 of the specification.

Another aspect of the invention, as set forth in independent claim 25, relates to a method for presenting an autostereoscopic image. A plurality of high resolution two-dimensional digital image sources are combined with a plurality of lenslet pixel modules with each pixel module having a respective fly's eye lenslet and being operable to produce a complete 3D pixel. Light is projected from each digital image source through the respective lenslet pixel module to form the autostereoscopic image from a plurality of

3D pixels. See e.g., Figures 9 and 10, page 12, line 23 through page 13, line 27 of the specification, and page 24, line 25 through page 28, line 9 of the specification.

Still another aspect of the invention, as set forth in independent claim 29, relates to a lenslet pixel module for projecting light and sensing light. The lenslet pixel module includes a two-dimensional image source operably coupled with a respective lenslet whereby a portion of a selected two-dimensional image may be projected from the lenslet to form at least one complete 3D pixel of an autostereoscopic image. The lenslet pixel module also includes a sensor disposed within and forming a portion of the lenslet pixel module. The sensor is operably coupled with a fly's eye lenslet to allow the sensor to detect at least one real object in front of the lenslet pixel module. See e.g., Figures 9 and 12, page 12, line 23 through page 13, line 27 of the specification, page 24, line 25 through page 26, line 23 of the specification, and page 29, line 7 through page 31, line 2 of the specification.

ISSUES

The issues in this appeal are:

I. Whether claims 1, 3, 9, 14 and 15 are patentable under 35 U.S.C. § 102(e) over Woodgate.

II. Whether claims 2, 4-8, 10-13, and 16-32 are patentable under 35 U.S.C. § 103(a) over Woodgate, Official Notice, Iwata, Burger, and Ashihara taken alone or in combination.

GROUPING OF CLAIMS

For the purposes of this appeal the claims are grouped as follows:

Claims 1-32 stand or fall together.

ARGUMENT

Claims 1, 3, 9, 14 and 15 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Woodgate et al., U.S. Patent No. 6,008,484 (Woodgate). Claims 2, 4-7, 11, and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate

in view of Official Notice. Claim 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Official Notice, and further in view of Iwata et al., U.S. Patent 5,982,342 (Iwata). Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Iwata. Claims 10, 16-18, 22, 23, 25-27, 29, and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, U.S. Patent 5,973,844. Claims 20, 28, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger and further in view of Iwata. Claims 19, 21, and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, and further in view of Ashihara et al., U.S. Patent 5,883,739 (Ashihara). Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woodgate in view of Burger, and further in view of Official Notice.

The appellant respectfully traverses these rejections.

Woodgate, Official Notice, Iwata, Burger, and Ashihara taken alone or in combination neither teach nor suggest an apparatus for displaying a three-dimensional image including:

> . . . a plurality of lenslet pixel modules with each module defined in part by a respective lenslet;
>
> each lenslet pixel module corresponding with and operable to produce a complete 3D pixel of the three-dimensional image;

as required by independent claim 1 and generally required by independent claims 17, 25, and 29.

In his Final Office Action of September 27, 2002, the Examiner states:

> Regarding claim 1, Woodgate et al. discloses . . . a plurality of lenslet pixel modules with each module defined in part by a respective lenslet (3, Figure 20), each lenslet pixel module corresponding with and operable to produce a complete 3D pixel of the three-dimensional image (see Figure 20-, column 1, lines 51-55) . . . . (Final Office Action of September 27, 2003, page 2, ¶4)

The appellant respectfully disagrees. Woodgate's parallax optic **3** is not in and of itself a lenslet pixel module within the meaning of claim 1. At best, parallax optic **3** (or a

portion thereof) might teach or suggest the appellant's "respective lenslet," however the appellant does not concede this point. Nevertheless, the various descriptions of Woodgate's parallax optic **3** make clear that it is not the claimed lenslet pixel module.

Regarding the claim limitation that "each lenslet pixel module corresponding with and operable to produce a complete 3D pixel of the three-dimensional image," the Examiner refers to Figure 20 and a portion of the text of Woodgate which states (including the entire paragraph from which the Examiner cites):

> **FIG. 1** of the accompanying drawings illustrates a mechanically tracked autostereoscopic 3D display comprising a backlight **1** which illuminates a spatial light modulator (SLM) in the form of a liquid crystal device (LCD) **2**. A movable lenticular screen **3** is disposed between the observer and the LCD **2** and comprises a plurality of cylindrically converging lenticules such as **4**. Each lenticule **4** is optically aligned with two columns of picture elements (pixels) such as **5** and **6**. Alternate columns of pixels display vertical strips of a respective 2D image and the lenticules **4** direct light from the backlight passing through the columns **5** and **6** into two viewing zones **7** and **8** for the left and right eyes of an observer.

Thus, neither the portion of Woodgate explicitly cited by the Examiner, the portions of Woodgate describing Figure 20, nor any other portion of Woodgate teach or suggest anything corresponding to a *lenslet pixel module* that corresponds with and is operable to produce *a complete 3D pixel* of the three-dimensional image.

The appellant further notes that in rejecting claim 1 under § 102(e), the Examiner refers to very disparate portions of the teachings of Woodgate. According to Woodgate, Figure 20 "illustrates a position sensor for use in the display of FIG. 19" and thus represents part of Woodgate's described invention. However, Figure 1 (and thus the corresponding text cited by the Examiner) refers to "diagrammatic plan views of known mechanically tracked autostereoscopic 3D displays," i.e., what Woodgate considers to be the prior art. MPEP §2131 makes clear the requirements for anticipation:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913,

> 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). (Emphasis added)

Thus, in addition to showing every element, the reference must teach their arrangement as required by the claim, and Woodgate does not teach the appellant's claimed arrangement of elements.

In his *Response to Arguments* presented in the Final Office Action of September 27, 2002, page 12, no. 11, the Examiner makes further reference to Woodgate, "abstract, column 1, lines 6-8 and column 11, lines 58-60 which clearly state that the apparatus is an autostereoscopic 3D display." While the appellant does not take issue with this quoted characterization of Woodgate, he nevertheless must respectfully submit that the mere fact that Woodgate teaches "an autostereoscopic 3D display" does not teach or suggest a lenslet pixel module defined in part by a respective lenslet, and corresponding with and operable to produce a complete 3D pixel of the three-dimensional image. as required by independent claim 1.

The Examiner goes on to state:

> However, the term "complete 3D pixel" is not defined [in the specification]. Figure 20 of Woodgate et al. clearly shows a lenslet pixel module (3) corresponding with and operable to produce a complete 3D pixel of the three dimensional image. Furthermore . . . column 12, lines 9-15, states, "As the observer eyes move to the lateral centres of adjacent pixels or pixel columns, the observer [spot] passes over a respective one of the detector elements 40 whose output triggers **switching of the image data supplied in the other unobserved column of pixels** aligned with the associated parallax element of the parallax optic 3." Therefore, each module (3) can be read as the smallest addressable element in the electronic display which produces a complete 3D pixel of the three dimensional image as claimed. (Emphasis in original)

The appellant respectfully disagrees. Although the term "complete 3D pixel" may not be explicitly defined in the specification, the term "3D pixel" is (see, e.g., page 12, line 23 through page 13, line 27 of the specification) and the meaning of "complete" will be well known to those having skill in the art. The Examiner makes the conclusory statement that "Figure 20 of Woodgate et al. clearly shows a lenslet pixel module (3) corresponding

with and operable to produce a complete 3D pixel of the three dimensional image." There is nothing shown in Figure 20 of Woodgate to support this conclusion. As for the cited portion of Woodgate's text, the fact that Woodgate teaches switching of the image data supplied in the other unobserved column of pixels aligned with the associated parallax element of the parallax optic **3** in response to observer detection does *not*, as the Examiner concludes, teach or suggest that each parallax optic **3** "produces a complete 3D pixel of the three dimensional image as claimed." Woodgate simply does not teach or suggest what, if any, portion of an image parallax optic **3** corresponds with or is operable to produce, and it certainly does not each or suggest that parallax optic **3** corresponds with and is operable to produce a complete 3D pixel.

Accordingly, the appellant respectfully submits that independent claims 1, 17, 25, and 29 are allowable over Woodgate, Official Notice, Iwata, Burger, and Ashihara taken alone or in combination. Claims 2-16, 18-24, 26-28, and 30-32 depend from claims 1, 17, 25, and 29 respectively and are allowable for at least this reason.

CONCLUSION

The appellant respectfully submits that claims 1-32 are allowable over Woodgate, Official Notice, Iwata, Burger, and Ashihara taken alone or in combination. For at least the reasons stated above, claims 1-32. The appellant respectfully requests that the Board reverse the rejections of these claims.

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7/28/03
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Respectfully submitted,

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APPENDIX

1. Apparatus for displaying a three-dimensional image, comprising:

a plurality of lenslet pixel modules with each module defined in part by a respective lenslet;

each lenslet pixel module corresponding with and operable to produce a complete 3D pixel of the three-dimensional image;

a plurality of two-dimensional moving image sources associated with and forming a portion of the lenslet pixel modules; and

the lenslet pixel modules cooperating with each other to form a projector array for displaying the three-dimensional image.

2. The apparatus of Claim 1 further comprising a fly's eye lens sheet having a plurality of fly's eye lenslets disposed thereon to provide the respective lenslet for each lenslet pixel module.

3. The apparatus of Claim 1 further comprising at least one lenslet pixel module having a partially silvered mirror and a sensor disposed adjacent thereto.

4. The apparatus of Claim 1 further comprising at least one lenslet pixel module having a high resolution two-dimensional digital image source associated with and forming a portion of the at least one lenslet pixel module.

5. The apparatus of Claim 1 further comprising:

the plurality of lenslet pixel modules disposed in an array relative to each other;

at least two of the lenslet pixel modules having a respective sensor disposed therein;

the sensors cooperating with each other to form a sensor array having a first focal plane;

the plurality of fly's eye lenslets associated with the lenslet pixel modules cooperating with each other to form a projector array having a second focal plane; and

the focal plane of the sensor array corresponding generally with the focal plane of the projector array.

6. The apparatus of Claim 5 wherein at least one sensor comprises a video sensor.

7. The apparatus of Claim 5 wherein at least one sensor comprises a charge coupled device.

8. The apparatus of Claim 1 wherein the three-dimensional image is full parallax.

9. The apparatus of Claim 1 further comprising:

the plurality of lenslet pixel modules disposed in an array relative to each other;

at least two of the lenslet pixel modules having a respective sensor disposed therein; and

the sensors cooperating with each other to form a sensor array for sensing at least one real three-dimensional object.

10. The apparatus of Claim 9 further comprising a central processing unit operable to receive information from the sensor array and to provide information to the projector array to allow interaction between the at least one real three-dimensional object and the three-dimensional image.

11. The apparatus of Claim 1 wherein at least one of the plurality of two-dimensional moving image sources is selected from the group consisting of a cathode ray tube, a liquid crystal display, digital micro device mirror, a flat panel display, a respective section of a diffuser backlit by a video projection system, a microelectronicmechanical system, or a light emitting diode.

12. The apparatus of Claim 1 further comprising:

the plurality of lenslet pixel modules disposed in an array relative to each other; and

a high resolution two-dimensional image source associated with each respective lenslet pixel module.

13. The apparatus of Claim 1 further comprising:

the plurality of lenslet pixel modules disposed in an array relative to each other;

a two-dimensional high resolution image source associated with two or more lenslet pixel modules; and

each of the lenslet pixel modules associated with a dedicated region of the respective high resolution two-dimensional image source.

14. The apparatus of Claim 1 further comprising:

the plurality of lenslet pixel modules disposed in an array relative to each other;

a plurality of sensors interspersed within the array of lenslet pixel modules;

the sensors cooperating with each other to form a sensor array having a first focal plane; and

the lenslet pixel modules cooperating with each other such that the projector array has a second focal plane.

15. The apparatus Claim 14 wherein the first focal plane corresponds generally with the second focal plane.

16. The apparatus of Claim 14 wherein the first focal plane has an orientation different from the second focal plane.

17. A system for presenting a scalable, autostereoscopic image comprising:

a plurality of lenslet pixel modules with each module defined in part by a respective lenslet;

each lenslet pixel module corresponding with and operable to produce a complete 3D pixel of the autostereoscopic image;

a plurality of two-dimensional image sources associated with and forming a portion of each lenslet pixel module; and

at least one computer processing unit providing an input to at least one of the plurality of two-dimensional image sources.

18. The system of Claim 17 wherein the input supplied to the two-dimensional image sources comprises digital data corresponding to a two- dimensional image.

19. The system of Claim 17 wherein the input supplied to the two-dimensional image source comprises a moving video image.

20. The system of Claim 17 wherein the autostereoscopic image is full parallax.

21. The system of Claim 17 further comprising:

a plurality of first computer processing units having at least one video output channel to supply video images to the two-dimensional image sources;

a two-dimensional image source coupled with one of the first computer processing units; and

a master computer processing unit coupled with and supplying data to the first computer processing units.

22. The system of Claim 17 further comprising:

a plurality of sensors with each sensor disposed within one of the lenslet pixel modules; and

each sensor coupled with the computer processing unit to provide information to the computer processing unit concerning a real object in front of the lenslet pixel modules.

23. The system of Claim 17 wherein the lenslets further comprise a plurality of lens selected from the group consisting of cylindrical, convex, concave, gradient index, diffractive, refractive, holographic optical elements and other prisms which form an autostereoscopic image.

24. The system of Claim 17 further comprising:

a plurality of sensors with each sensor coupled with the computer processing unit to provide information to the computer processing unit concerning a real object in front of the lenslet pixel modules;

a portion of the sensors providing high resolution information about the real object; and

a portion of the sensors providing low resolution information about the real object.

25. A method for presenting an autostereoscopic image comprising:

combining a plurality of high resolution two-dimensional digital image sources with a plurality of lenslet pixel modules with each pixel module having a respective fly's eye lenslet and being operable to produce a complete 3D pixel; and

projecting light from each digital image source through the respective lenslet pixel module to form the autostereoscopic image from a plurality of 3D pixels.

26. The method of Claim 25 further comprising installing at least two sensors within respective lenslet pixel modules for use in sensing at least one real object disposed in front of the lenslet pixel modules.

27. The method of Claim 25 further comprising:

sensing at least one real object disposed in front of the lenslet pixel modules with the sensors; and

combining information received from the sensors concerning the at least one real object with information supplied to the high resolution two-dimensional image sources to allow interaction between the at least one real object and the full-parallax autostereoscopic image produced by the lenslet pixel modules.

28. The method of Claim 25 wherein the autostereoscopic image is full parallax.

29. A lenslet pixel module for projecting light and sensing light comprising:
a two-dimensional image source operably coupled with a respective lenslet whereby a portion of a selected two-dimensional image may be projected from the lenslet to form at least one complete 3D pixel of an autostereoscopic image;
a sensor disposed within and forming a portion of the lenslet pixel module; and
the sensor operably coupled with a fly's eye lenslet to allow the sensor to detect at least one real object in front of the lenslet pixel module.

30. The lenslet pixel module of Claim 29 wherein the sensor further comprises a digital video camera.

31. The lenslet pixel module of Claim 29 further comprising a portion of a full parallax three-dimensional electronic display.

32. The lenslet pixel module of Claim 29 further comprising the two-dimensional image source operable to form a portion of the image and the sensor operable to detect electromagnetic radiation from the at least one real object at substantially the same time.